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COTS Cost Estimation Model for the ECS Project

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Abstract

This paper provides a written description of the ECS Commercial-off-the-Shelf (COTS) Cost Estimation Model. This model provides a rough order of magnitude (ROM) type of cost estimate for COTS hardware, software, and associated maintenance. The model has been used extensively to support "What If" cost exercises as well as architecture trade studies and impact analysis for potential requirement changes.

Keywords: cost, model, COTS, ROM

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Abbreviations and Acronyms

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1. Introduction

1.1 Purpose

The purpose of this paper is to provide a written description of the ECS Commercial-off-the-Shelf (COTS) Cost Estimation Model. This model provides a rough order of magnitude (ROM) type of cost estimate for COTS hardware, software, and associated maintenance. This model has been used extensively in the time frame leading up to SDR and PDR to support "What If" cost exercises as well as Architecture Topology and Process On Demand trade studies. In addition, it has also been used to support impact analysis for potential requirement changes.

It should be noted that this is one of two COTS cost models; the second being the Bill Of Materials Procurement Cost Model (reference 231-TP-002-001 for details). The second model provides COTS cost estimates based on a detailed physical design such as the Bill of Materials (BOM) from the ECS contract.

1.2 Organization

This paper is organized as follows:

- Section 1 contains the introduction to this paper.
- Section 2 contains a general overview of the COTS Cost Estimation Model.
- Section 3 contains a detailed description of the various components that make up the model.
- Acronyms and Abbreviations are in the Appendices.

1.3 Review and Approval

This paper is an informal document approved at the Office Manager level. It does not require formal Government review or approval; however, it is submitted with the intent that review and comments will be forthcoming.

The ideas expressed in this paper are valid for the SDR/PDR time frame; the concepts presented here are a current description of the COTS Cost Estimation Model. It is expected to evolve and change with on-going "What If" cost exercises.

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2. General Description

The COTS Cost Estimation Model (referred to as the "model" throughout this document) is a life cycle cost estimation tool that provides an estimated At Price cost for COTS hardware and software and associated maintenance through the end of contract. The cost estimates are based on price/performance curves applied to processing loads and data volumes from AHWGP data and/or the SPSO product set database and element cost from our existing contract BOM.

2.1 Model Organization

The model is organized as a set of Excel spreadsheets that estimate cost for various major components of the system including processing, processing software, RAID disk, archive, archive software, distribution, information search/access, SMC/LSMs, and SDPS LANS. These estimates along with miscellaneous element cost from the contract BOM are then used as input to the Cost Summary component of the model. Figure 2-1 is a diagram showing the general flow of requirements from various sources into the various elements of the model and in essence shows the traceability of our cost estimates back to AHWGP data as well as the SPSO database and performance modeling results.

2.1.1 Inputs

2.1.1.1 AHWGP/SPSO/Modeling Inputs

The At Launch and Post Launch Data Volumes, Processing Loads, and Granule Volumes are summary tables generated from the AHWGP data and/or the SPSO Database. These are the primary inputs to the model. In the SDR time frame, the SDR Product Set was used. This was based on the February version of the SPSO Database. For PDR, the PDR Technical Baseline consists of the July version of the SPSO Database, modified by data from AHWGP. The summary tables derived from the PDR Technical Baseline provide data volumes and processing loads phased by year, by platform and by DAAC, and granule volumes by platform and DAAC. Tables 2-1, 2-2, and 2-3 show the summary totals for processing loads, data volumes, and granule volumes respectively from the PDR Technical Baseline. The complete tables for processing loads and data volumes also include the appropriate values on a platform by platform basis along with the platform launch date.

To support trade studies and various cost impact analyses, values in these summary tables are simply replaced with alternative values, typically from our performance models. For any given cost analysis activity, the best available data from SPSO, AHWGP, and performance modeling results are used.

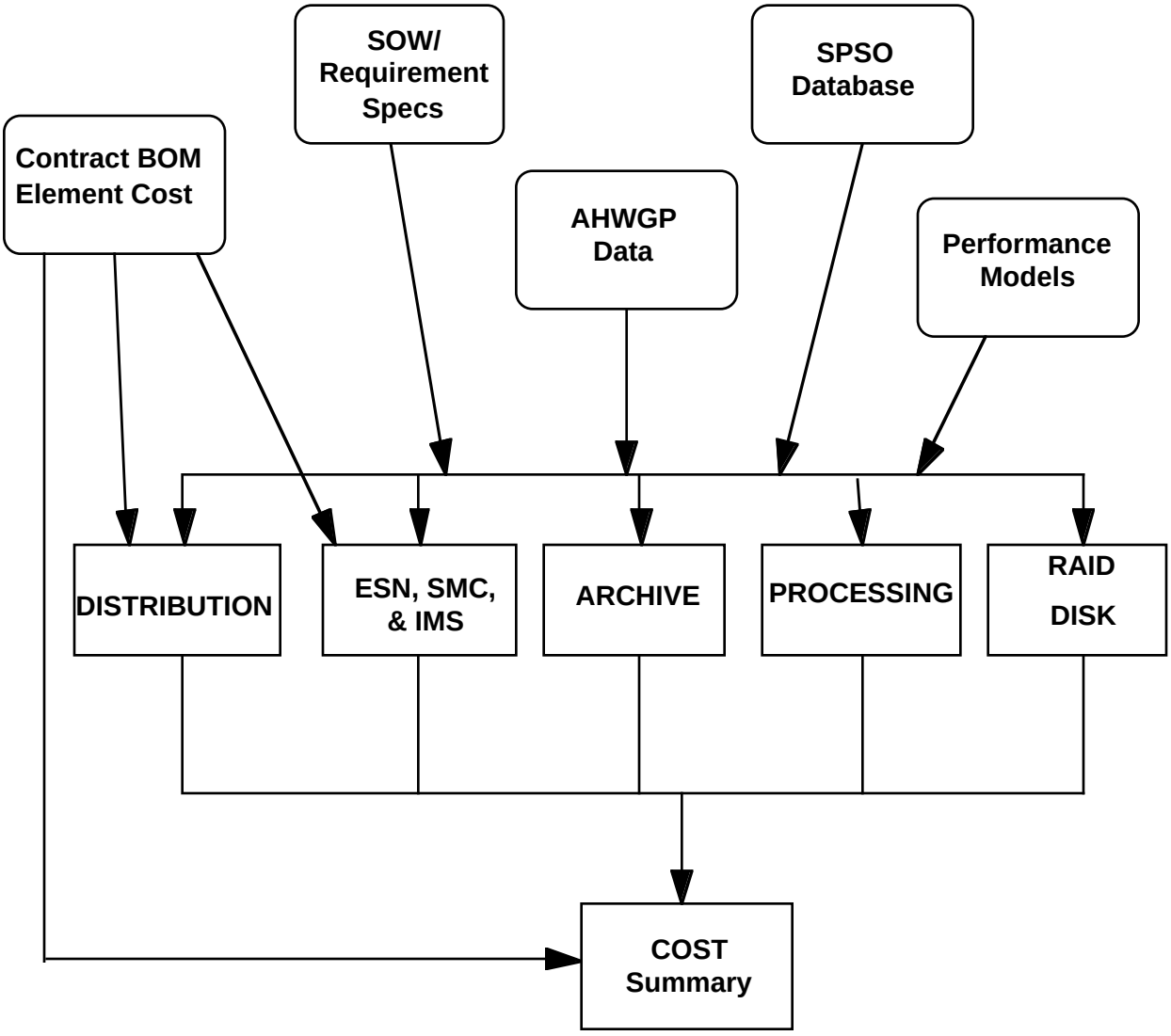

Figure 2-1. Model Requirements Flow

Table 2-1. AHWGP/SPSO Processing Loads;

	Year	DAACs								Total
		ASF	EDC	GSFC	JPL	LaRC	MSFC	NSIDC	ORNL	(MFLOPS)
TOTALS	Total									
	Total_97					13.89	0.42			14.31
	Total_98		147.62	3492.05		3711.39	0.42	0.97		7352.44
	Total_99		159.43	3493.08	5.38	6256.41	0.42	0.97		9915.69
	Total_00		166.38	7228.07	5.38	6256.62	9.07	1.69		13667.20
	Total_01		166.38	7228.07	5.38	6977.61	9.07	1.69		14388.19
	Total_02		166.38	7953.16	5.38	7628.61	9.07	1.69		15764.28
	Total_03			23.18				0.06		23.24
	Peak MFLOPS		166.38	7953.16	5.38	7628.61	9.07	1.69		15764.28

Table 2-2. AHWGP/SPSO Data Volumes

	Year	DAACs								Total
		ASF	EDC	GSFC	JPL	LaRC	MSFC	NSIDC	ORNL	(GB/day)
TOTALS	Total_L0		89.64	151.51	0.07	77.08	0.79			319.10
	Total_97			1.41		5.28	14.60			21.28
	Total_98		350.37	436.51		100.83	14.60	3.97		906.28
	Total_99		352.25	436.51	0.66	159.22	14.60	3.97		967.21
	Total_00		401.60	1295.20	0.66	159.26	20.08	6.89		1883.68
	Total_01		401.60	1295.20	0.66	160.80	20.08	6.89		1885.22
	Total_02		401.60	1296.63	0.66	192.30	20.08	6.89		1918.15
	Total_03			8.74				0.03		8.77
	Peak Volumes		491.24	1448.14	0.73	269.38	20.87	6.89		2237.25

Table 2-3. AHWGP/SPSO Granule Volumes

Launch	Platform	DAACs								Total
		ASF	EDC	GSFC	JPL	LaRC	MSFC	NSIDC	ORNL	Granules/Day
Aug-97	TRMM			32.00		114.33	472.56			618.89
Jun-98	AM1		1719.03	9875.73		295.93		811.43		12702.12
May-98	LANDSAT7		275.00							275.00
May-98	COLOR			70.00						70.00
Feb-99	ADEOSII				45.00					45.00
Mar-99	ALT_RADAR				33.00					33.00
Jun-99	ACRIMSAT					15.00				15.00
Jan-00	RSA_CNES					150.00				150.00
Jun-00	SS					150.00				150.00
Dec-00	PM1		1.00	4552.00		165.47	187.00	65.00		4970.47
Dec-02	CHEM			328.00		203.00				531.00
Jul-03	ALT_LASER			195.00				30.00		225.00
	Total Granules		1995.03	15052.73	78.00	1093.73	659.56	906.43		19785.48

1. TRMM Granules are from AHWGP Number of Executions per Day plus TSDIS estimates.
2. AM1 Granules are from AHWGP Number of Executions per Day.
3. PM1 Granules are from AHWGP Number of Executions per Day (CERES) and SPSO Granules/Day.
4. LANDSAT7 Granules are from LANDSAT7 estimates.
5. All other Granules are from SPSO Granules/Day.

2.1.1.2 Miscellaneous Parameters

The miscellaneous parameters include various constants for all spreadsheets in the model such as 365 days in a YEAR, a growth factor (ranging from 0% to 20%), and an end of contract date of October 31, 2002. A maintenance factor (normally 9.5%) is applied to the purchase price for hardware and software. This represents a yearly maintenance estimate and is applied through the end of contract starting one year after the procurement. A G&A and Fee factor (GAFEE) is also included to provide At Price life cycle cost estimates through the end of contract.

2.1.1.3 Archive Parameters

The archive parameters include such items as small (10 TB), medium (100 TB), and large (1000 TB) archive size, maximum archive size (also small, medium and large), archive site activation dates for the various DAACs, and a compression ratio, currently set at 1.5:1. Archive Price/Performance values can be selected from the aggressive, medium or expected price/performance curves. Archive software Price/Performance parameters provide for initial software license cost based on initial archive capacity and license upgrade cost based on increased capacity.

2.1.1.4 Processing Parameters

Capacity Phasing Parameters are used in conjunction with processing to satisfy the 4x capacity from the requirements specification. The IT and RT parameters provide pre-launch to launch multiplication factors for processing capacities. RP1 and RP2 provide corresponding factors for launch and post-launch time frames. The multiplication factor indicates the total processing capacity that will be provided in the associated time frame. For pre-launch time frames, the factor will be applied to the at launch requirements. Post launch factors will be applied to the appropriate post launch requirements. See the assumptions section for further details. A 25% efficiency factor is applied to the processing loads to account for system overhead (this is also from the requirements specification). There is a manpower component for operator's salary. Price/performance values are selected from the aggressive, medium or expected curves. This spreadsheet also contains maximum performance projections in MFLOPS over time.

2.1.1.5 RAID Disk Parameters

Capacity Phasing Parameters are also used in conjunction with RAID disk. The IT and RT parameters provide pre-launch to launch multiplication factors RAID disk capacities. RP1 and RP2 provide corresponding factors for launch and post-launch time frames. For RAID disk, the multiplication factor is multiplied by a disk factor to provide RAID disk capacity phased in proportion to processing capacity over time. See the assumptions section for further details. There are three sizes of RAID disk being utilized; large (100GB), medium (25 GB), and small (5GB) as well as maximum sizes for small (15GB) and medium (50GB). Price/performance values are selected from the aggressive, medium or expected curves.

2.1.1.6 Distribution Parameters

The distribution parameters include a real time (RT) factor, which indicates when relative to launch the distribution costs should be allocated, and distribution total cost as well as electronic and drive/media cost from the contract BOM. These costs from the contract BOM are used to calculate a dollars/GB value for both media and electronic distribution based on the Level 0 and Level 1-4 data volumes from the contract requirements. The dollars/GB is applied to the new product set volumes to estimate distribution costs.

2.1.1.7 ESN, IMS, and SMC Parameters

The parameters for the ESN, IMS, and SMC functions include contract requirements for L0-L4 data volumes and granule volumes. In addition, contract BOM costs for the IMS, SDPS LANs, and the File Server and Disk portions of SMC are used to calculate a dollar per unit which is subsequently applied to the new product volumes to estimate new component costs. Constant costs by DAAC are available for SMC workstation and non-SDPS LAN costs. These again are from the contract BOM and represent fixed costs that are simply carried forward to the Cost Summary component. Site activation dates indicate when these fixed costs are allocated. An RT (real time) parameter indicates when, relative to launch, the major costs should be allocated to each of the entities.

2.1.1.8 Cost Summary Parameters

The primary inputs to the Cost Summary component are outputs from the Archive, Processing, RAID Disk, Distribution, and ESN, SMC, and IMS components. Other parameters for this component include the fixed cost for FOS, Sustaining Engineering, and hardware and software to support the Data Assimilation Organization (DAO - also referred to as ROOD) as well as a percentage allocation of 22% for COTS software associated with processing. All of these parameters are derived from the contract BOM. Miscellaneous parameters include percentage allocations of FOS to platforms (currently AM-1) and fiscal year and percentage allocations of ROOD cost to fiscal year derived from the contract BOM.

2.1.2 Outputs

Outputs for the model are generally summarized for each DAAC by platform and by year.

2.1.2.1 Archive

The outputs for the archive component consist of the Compressed Data Volumes by Year for each platform, Total Archive Volume by Year (this represents the capacity purchased each year), and Archive Running Totals by year (this represents the total archive capacity over time), each measured in GB. In addition, Archive Cost by year for each platform as well as the cost by year for all platforms combined, Total Archive Cost by Platform, and Total Archive Software Cost by year are provided.

2.1.2.2 Processing

The output for the processing component is broken into six major areas. The first set of tables provide the Processing Load by year in MFLOPS for each platform as well as the totals for all platforms. The next two sections provide tables of the total number of computers needed and total number of operators required. Table four provides the Processing Cost by year for each platform as well as the cost by year for all platforms. Table five provides the Total Processing Cost by Platform. The last table provides the Operator Cost by year.

2.1.2.3 RAID

The RAID Disk spreadsheet provides the amount of RAID Disk required each year in GB for each platform as well as the totals for all platforms. It then calculates the RAID Disk Cost by Year for each platform as well as the cost by year for all platforms. The final table provides Total RAID Disk Cost by Platform.

2.1.2.4 Distribution

The Distribution output begins with the Level 0 Data Load by year and the Level 1-4 Data Load by year in GB/day for each platform and all platforms. Finally, the spreadsheet provides Distribution Costs for Media, Electronic, and total Distribution Cost by year for each platform as well as the cost by year for all platforms, and the Total Distribution Cost by Platform.

2.1.2.5 ESN, IMS, SMC

The ESN, IMS and SMC spreadsheet is, due to the similarity of calculations, an assembling of the three distinct entities. The ESN entity represents the SDPS LANs function in the Cost Summary component while the IMS entity represents the Info. Search/Access function. This spreadsheet begins by generating the L0-L4 Data Volumes by year (for ESN and IMS entities) and Granules per year (for SMC entity) for each platform as well as totals for all platforms. Finally, it provides the cost tables for the individual entities. ESN and SMC each have three sets of tables. The first table contains the Site Activation Cost by year for AM-1 (these represent fixed costs from the contract BOM that are allocated to the AM-1 platform). The second set of tables contain the cost by year for each platform as well as the cost by year for all platforms. The last table contains the cost by platform. The IMS entity does not have any fixed cost and therefore only generates the second and third cost tables.

2.1.2.6 Cost Summary

The Cost Summary provides cost breakouts by function, platform, level, and fiscal year. It also provides a percentage of support that can be provided to each platform where budget dollars are allocated on a first come, first serve basis according to launch dates. When the budget is exhausted, subsequent platforms cannot be supported. The spreadsheet also provides a percentage of support to all platforms assuming the budget is allocated proportionately across all platforms.

2.2 Assumptions

In the process of implementing the model, numerous assumptions were made. These assumptions are discussed in the following subsections.

2.2.1 Archive

Archive capacity for the nth year is purchased in the nth year. Data is stored in the archive in compressed form where a 1.5 to 1 compression ratio is assumed. It is further assumed that the compression/decompression is performed by the tape drive/controller. Helical Scan technology is assumed for releases A and B, while optical tape is assumed for releases C and D. Version 0 migration capacity is included with the 125 TB capacity from the SOW and is provided at the time of archive Site Activation. The element cost of Archive Management COTS Software is based on archive capacities by DAAC and current cost of E-Systems FileServ File Storage Management Software.

2.2.2 Processing

The Capacity Phasing Parameters satisfy the 4x processing capacity according to the requirements specification. The current settings for these parameters are shown in Table 2-4.

Table 2-4. Capacity Phasing Parameters

Parameter	Multiplication Factor	Time Frame Relative to Launch (Years)
IT	.3	-2
RT	.9	-1
RP1	1	1
RP2	2	2

The IT parameter provides for .3x capacity of the at launch requirement two years before launch. The RT parameter provides for an additional .9x capacity of the at launch requirement one year before launch. The RP1 and RP2 parameters provide for an additional 1x capacity 1 year after launch, and 2x capacity 2 years after launch respectively based on the corresponding post launch requirements. Per the requirements specification, there is a 25% efficiency factor applied to these capacities to allow for system overhead.

2.2.3 RAID Disk

RAID Disk capacities are phased and purchased in conjunction with processing capacity phasing. In the SDR time frame, 3 days worth of peak data volume was assumed from the product set data volumes based on preliminary performance modeling results. This was reduced to 2 days worth, assuming the implementation of a smart scheduler, and currently also applies for the PDR time frame. The phasing for two days worth of RAID Disk is proportional to the 4x

processing capacity phasing. This amounts to .15x capacity 2 years before launch, .45x additional capacity one year before launch, .5x additional capacity 1 year after launch, and 1x additional capacity 2 years after launch.

2.2.4 Price and Performance Curves

Price/performance curves are used to reflect the rise in capacity and reduction in price as a function of time. EDS provides the price/performance curves that are used for the Archive, Processing, and RAID Disk Cost Components. Three sets of curves are provided for each of these components; expected, medium risk, and aggressive or high risk. Our "what if" cost exercises have used the expected and aggressive curves for processing and RAID Disk estimates, and a combination of the expected, medium, and aggressive curves for the archive estimates. These two cases are identified at the Expected and Hybrid Cases in the Cost Summary component.

The Processing Price/Performance curve has a slope in which the Price/MFLOP decreases by about 21% per year for the “expected” case. The starting point for this curve is based on the average Price/MFLOP of an SGI Power Challenge with 2 processors and a DEC 7000/620 with 2 processors.

The RAID Disk Price/Performance curves have a slope in which the Price/GB decreases by about 28% per year for the “expected” case. Three sets of the curves are provided for small (5 GB), medium (25 GB), and large (100 GB) RAID Disk. The appropriate curve is selected based on the total RAID Disk capacity. The starting point for these curves is based on the average Price/GB of Maximum Strategy and IBM RAID Disk.

The Archive Price/Performance curves have a slope in which the Price/TB decreases by about 5% per year through 1999 and then decreases by about 32% per year through the end of contract (October 31, 2002) for the “expected” case. The change in slope is associated with an assumed change in archive technology. The early years assume helical scan magnetic tape while the latter years assume optical tape. This is accomplished by using the expected archive price/performance values for the years 1994 through 1999 and the aggressive price/performance values for the years 2000 through the end of contract for the “expected” case. The “hybrid” case uses the medium risk archive price/performance curve in the early years and the aggressive price/performance curves in the latter years. Three sets of curves are provided for small (10 TB), medium (100 TB), and large (1000 TB) archives. The appropriate curve is selected based on the total archive capacity. The starting point for these curves are based on the average Price/TB of StorageTek and E-Systems storage silos and includes the cost of robotics, tape drives, media, and the basic robotic software driver.

2.2.5 Product Set Comparison

Product Set comparisons are used to estimate cost in the Distribution and ESN, SMC, and IMS Cost components. Element costs for these entities are determined from the contract BOM and estimated cost is calculated as follows:

Estimated Cost = Contract Cost * PDR or SDR Data Volume / Contract Data Volume

The SMC component uses granule volumes instead of data volumes in the above calculations and the factor is only used for File servers and disk portions of SMC and LSMs. The workstation and other costs associated with the SMC component are fixed costs and simply carried forward. The Distribution component uses level 0 data volume for media distribution and level 1-4 data volume for electronic distribution. Processing Load comparisons are not used in the cost estimation process but are included to show that this has been the major area of change. Table 2-5 shows the product set comparisons.

Table 2-5. Product Set Comparisons

	Contract Product Set	**SDR Product Set**	**PDR Product Set**
Processing Loads (MFLOPS)	410.30	14872.75	15764.28
Level 0 Data Volume (GB/Day)	196.79	302.27	319.10
Level 1-4 Data Volume (GB/Day)	694.58	2937.58	1917.15
Total Data Volumes (GB/Day)	891.37	3239.85	2236.25
Granules/Day	17598	21548.48	19785.48

2.2.6 Miscellaneous Assumptions

The element cost from the contract and/or Change Order #1 BOMs is used for LANs that support FOS, SMC, Modems/concentrators, and Gateways, etc. (all non-SDPS specific Comm), all FOS, all workstations and peripherals, sustaining engineering, and ROOD DAO. These are simply carried forward as fixed costs in the ESN, SMC, and IMS component or directly in the Cost Summary component. The element cost of science processing COTS software is estimated at 22% of the science processing hardware derived from the contract BOM and is calculated directly in the Cost Summary component. Maintenance is assumed to start 1 year after purchase and continue until the end of contract. Maintenance cost is assumed at 9.5% of purchase price per year for the Expected Case and 7.5% of purchase price per year for the Hybrid Case.

3. Detailed Description

Each spreadsheet in the model consists of a series of tables, describing the various elements of that portion of the model. In the interest of consistency, the tables will generally list all DAACs (ASF, EDC, GSFC, JPL, LaRC, MSFC, NSIDC, and ORNL) and all platforms. The platforms differ between the SDR and PDR technical baselines but in the PDR time frame include TRMM, AM-1, LANDSAT 7, COLOR, ADEOS II, ALT RADAR, ACRIMSAT, RSA/CNES, SPACE STATION, PM-1, CHEM, and ALT LASER.

3.1 Archive Cost Component

The Archive Cost component estimates the total archive capacities and costs over the life of the contract. Figure 3-1 shows the relationship between the input and output tables within this component.

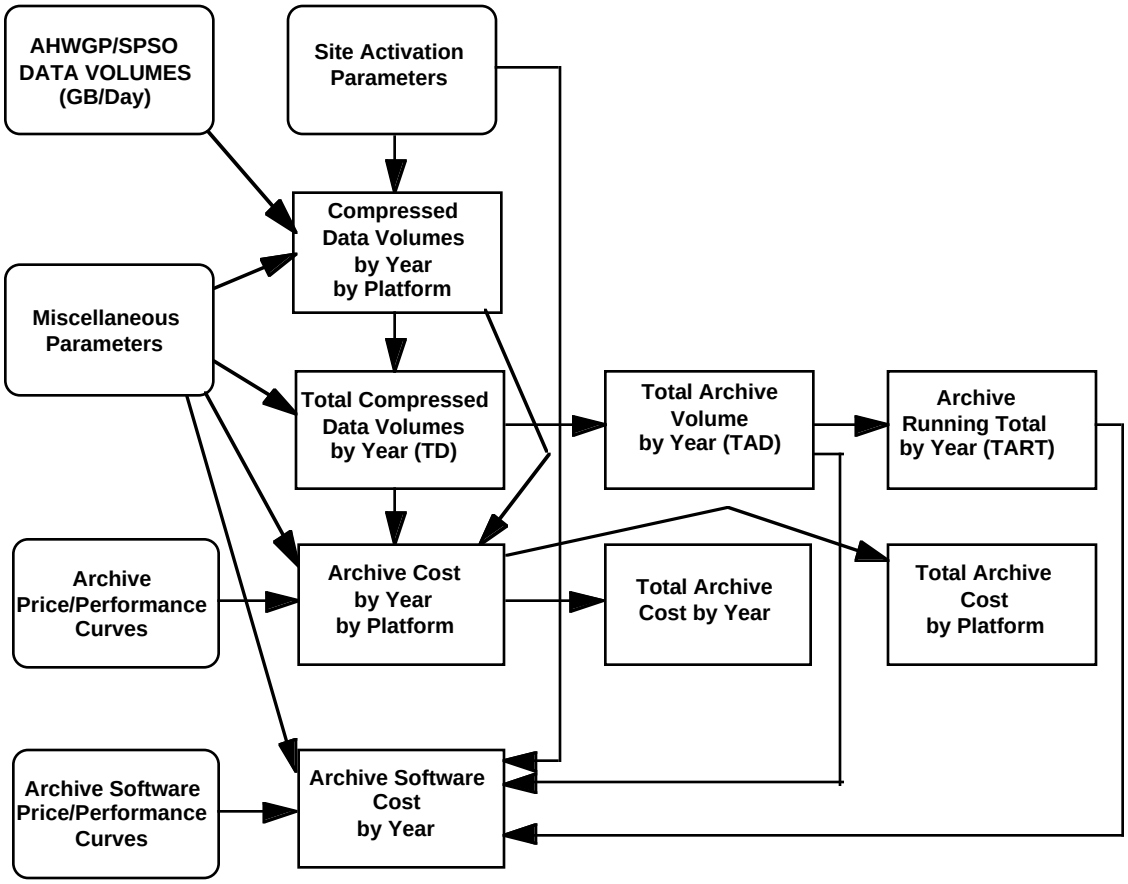

Figure 3-1. Archive Cost Component Organization

3.1.1 Inputs

3.1.1.1 Product Set Data Volumes

The At Launch and Post Launch Product Set Data Volumes by Platform and DAAC represents the primary inputs for the Archive Cost Component. For SDR this was a summary of the SPSO Database. For PDR it represents a summary of the integration of the SPSO and AHWGP databases. It allocates the level 0 data volumes (in GB/Day) by DAAC for each platform as well as the level 1-4 data volumes (also in GB/Day) by year by DAAC for each platform. Table 3-1 shows the PDR Product Set data volumes for the AM-1 Platform and is representative of the content of data volumes for all platforms in the complete table.

Table 3-1. AM-1 Data Volumes

Launch	Platform	DAACs								Total (GB/Day)
		ASF	EDC	GSFC	JPL	LaRC	MSFC	NSIDC	ORNL	
Jun-98	AM1_L0		89.640	66.960		41.286				197.886
	AM1_97									
	AM1_98		210.365	432.790		89.489		3.974		736.618
	AM1_99		212.244	432.790		147.836		3.974		796.845
	AM1_00		212.244	432.790		147.836		3.974		796.845
	AM1_01		212.244	432.790		141.113		3.974		790.122
	AM1_02		212.244	432.790		141.113		3.974		790.122
	AM1_PEAK		212.244	432.790		147.836		3.974		796.845

3.1.1.2 Parameters

Miscellaneous parameters include the number of days in a YEAR, the COMPRESSION ratio, the GROWTH, MAINT (maintenance), and GAFEE factors, archive sizes (10TB for small, 100TB for medium, and 1000TB for large, archive thresholds (50TB for small and 500TB for medium) which are used to determine which price/performance curve is used, and the EOC date of 10/31/94.

The Site Activation parameters are the expected archive start dates for the various DAACs. Currently, EDC, GSFC, LaRC, and MSFC are to activated in May, 1996 to support Release A. ASF, JPL, NSIDC, and ORNL go on-line in January, 1997 to support Release B.

The Archive Price/Performance Parameters show the price/TB by year, for the large (1000 TB), medium (100 TB), and small (10 TB) archive sizes. Values can be selected from the aggressive, medium, or expected curves. See the Assumptions section for further details on how these curves are currently used.

The Archive Software Price/Performance Parameters shows the initial licensing cost of archive software for archive sizes ranging from 0 to 3,000 TB. The table also shows the cost of license upgrades as the archive increases in size. The estimated license upgrade costs are not linearly associated with the upgrade size.

3.1.2 Outputs

3.1.2.1 By Year Data Volumes

The first set of output tables show the compressed data volumes (GB/year) by year for each DAAC, one for V0, one for each of the platforms, and one totaling the volumes for all platforms (TD). Two additional tables calculate the total archive volume by year uncompressed (TAD) and the archive running totals by year uncompressed (TART). As part of the contractual requirements, archive capacity must be maintained for an additional year past the end of contract. Therefore, these tables contain a line for data volumes in 2003.

For V0, the V0 Data quantity (GB) for each DAAC is multiplied by the compression ratio in the year of the DAACs archive site activation date.

For each platform, the compressed data volumes are set to zero for the years prior to launch. In the year of the launch, the sum of the following is multiplied by the compression ratio to determine the archive volume requirement for that year:

1. The level 0 data volume (GB/Day) * number of days per year
2. The peak level 1-4 data volume * .5 * number of days per year
3 The level 1-4 data volume for that year * the number of days remaining from launch until end of year

This provides for a years worth of level 0 archive capacity and 6 months worth of level 1-4 capacity for reprocessing in accordance with the requirements specification as well as the capacity to store the level 1-4 for the fractional portion of that year. For each year after launch, that years data volume is multiplied by the compression ratio and number of days per year to provide that years capacity. In the last year of the contract (2002), a year and 10 months worth of level 1-4 data volume capacity is provided to satisfy the requirement for a years worth of additional archive capacity at EOC (10/31/94). A growth factor (currently 0%) is applied to the above computations to allow for a non-compounded yearly data volume growth after launch. In the SDR time frame, the growth factor was 20%.

The Total Compressed Data Volume by Year (TD), is simply a summation of the previous platform and V0 tables.

The Total Archive Volume by year (TAD) table is merely a conversion from the preceding total compressed volume table (TD), calculated by dividing the values in the TD table by the compression factor. Table 3-2 is a sample of this table based on the PDR Product Set and represents the archive capacities purchased each year at each DAAC.

Table 3-2. Total Archive Volume by Year

		DAACs								TOTAL
		ASF	EDC	GSFC	JPL	LaRC	MSFC	NSIDC	ORNL	GB/YEAR
Dec-94	TAD_94									
Dec-95	TAD_95									
Dec-96	TAD_96		100000	10000		10000	5000			125000
Dec-97	TAD_97	14821		192	2809	750	2009	1194	1000	22775
Dec-98	TAD_98		165671	184713		62654	5328	1457		419822
Dec-99	TAD_99		128570	159327	361	58121	5328	1451		353157
Dec-00	TAD_00		137577	346104	240	61967	6592	1982		554462
Dec-01	TAD_01		155591	659523	240	62335	8593	3045		889327
Dec-02	TAD_02		146584	473185	240	77030	7328	2513		706882
Oct-03	TAD_03		146584	476676	240	86302	7328	2523		719653
	TAD	14821	980577	2309719	4131	419160	47507	14164	1000	3791079

The Archive Running Total by Year (TART) table is produced from TAD by summing the current year and all previous years in TAD. This table shows what the total archive capacity is at each DAAC at any given time.

3.1.2.2 Archive Cost By Year

The next set of tables calculate the Archive Cost by year for V0, each platform, and the total for all platforms. Archive costs for 2003 data volumes are included in the costs for 2002. Table 3-3 shows the format of all cost tables within the Archive, Processing , RAID Disk, Distribution, and ESN, SMC, and IMS components. One of these tables exists for each platform in addition to the total for all platforms as shown. The table is shown in two parts to fit on the page in portrait format.

Table 3-3. Archive Cost by Year

		DAACs							
		ASF	**EDC**	**GSFC**	**JPL**	**LaRC**	**MSFC**	**NSIDC**	**ORNL**
Dec-94	**Total_ACost_94**								
Dec-95	**Total_ACost_95**								
Dec-96	**Total_ACost_96**		$	$		$	$		
Dec-97	**Total_ACost_97**	$		$	$	$	$	$	$
Dec-98	**Total_ACost_98**		$	$		$	$	$	
Dec-99	**Total_ACost_99**		$	$	$	$	$	$	
Dec-00	**Total_ACost_00**		$	$	$	$	$	$	
Dec-01	**Total_ACost_01**		$	$	$	$	$	$	
Dec-02	**Total_ACost_02**		$	$	$	$	$	$	
	Total_ACost	$	$	$	$	$	$	$	$

		MFG. COST	MAINTENANCE	MAINTENANCE BY YEAR	AT PRICE ($K)
Dec-94	Total_ACost_94				
Dec-95	Total_ACost_95				
Dec-96	Total_ACost_96	$	$		$
Dec-97	Total_ACost_97	$	$	$	$
Dec-98	Total_ACost_98	$	$	$	$
Dec-99	Total_ACost_99	$	$	$	$
Dec-00	Total_ACost_00	$	$	$	$
Dec-01	Total_ACost_01	$	$	$	$
Dec-02	Total_ACost_02	$		$	$
	Total_ACost	$	$	$	$

For V0 and each platform, the total amount of compressed data for each DAAC from table TD is compared to the size of the small archive maximum (currently 50,000GB) and medium archive maximum (currently 500,000GB). If the total size from table TD is smaller than 50,000, the small archive price/TB curve is used to calculate cost. If the total size is less than 500,000, the medium price/TB curve is used. Otherwise, the large archive price/TB curve is used. For a given year, the appropriate GB/Year from the compressed data volumes are multiplied by the appropriate price/TB and divided by 1000 to convert GB to TB to obtain the manufacturing cost.

The maintenance cost are calculated in two steps. The first step multiplies the total manufacturing cost for a given year by the MAINT factor (currently 9.5%) and the number of years remaining in the contract minus one (no maintenance in the first year) to get the total maintenance costs through the end of contract for that years worth of purchases. The second step is to redistribute those maintenance costs evenly starting one year after purchase. These steps are shown by Table 3-3 above with the Maintenance column representing the first step and the Maintenance by Year column representing the second step.

Then, the At Price cost is determined by multiplying the sum of the year's manufacturing and maintenance by year cost by GAFEE and dividing by 1,000 to convert to $K.

Finally, the Total Archive Cost by Year is calculated by taking the sums of the corresponding platform cost tables.

3.1.2.3 Total Archive Cost By Platform

To provide an archive cost breakout by platform and DAAC, the total cost from each of the platform cost by year tables is carried forward to this table. These summary totals should be identical to the totals in the Total Archive Cost by Year table. Table 3-4 shows the format of this table which again is representative of all Cost by Platform tables within the model. As in Table 3-3, this table is also shown in two parts. The Maintenance and the Maintenance by Year columns contain the same values. While the second column is not needed, it is there for consistency within the spreadsheets.

Table 3-4. Total Archive Cost by Platform

	Platform	DAACs							
		ASF	EDC	GSFC	JPL	LaRC	MSFC	NSIDC	ORNL
TOTAL ARCHIVE COST BY PLATFORM	V0	$	$	$	$	$	$	$	$
	TRMM			$		$	$		
	AM-1		$	$		$		$	
	LANDSAT7		$						
	COLOR			$					
	ADEOS II				$				
	ALT RADAR				$				
	ACRIMSAT					$			
	RSA_CNES					$			
	SPACE STATION					$			
	PM-1		$	$		$	$	$	
	CHEM			$		$			
	ALT LASER			$				$	
	Total	$	$	$	$	$	$	$	$

	Platform	MFG. COST	MAINTENANCE	MAINTENANCE BY YEAR	AT PRICE ($K)
TOTAL ARCHIVE COST BY PLATFORM	V0	$	$	$	$
	TRMM	$	$	$	$
	AM-1	$	$	$	$
	LANDSAT7	$	$	$	$
	COLOR	$	$	$	$
	ADEOS II	$	$	$	$
	ALT RADAR	$	$	$	$
	ACRIMSAT	$	$	$	$
	RSA_CNES	$	$	$	$
	SPACE STATION	$	$	$	$
	PM-1	$	$	$	$
	CHEM	$			$
	ALT LASER	$			$
	Total	$	$	$	$

3.1.2.4 Total Archive Software Cost by Year

The last table in the Archive Cost component estimates Archive software cost. Years prior to the DAAC's site activation date are set to zero. For the activation year, the initial software licensing fee is established based on the archive size that year from the archive running total table (TART). For subsequent years, it establishes the license upgrade cost based upon the archive volume change for the current year from the total archive volume table (TAD).

3.2 Processing Cost Component

The Processing Cost Component estimates total processing loads and processing costs over the life of the contract. Figure 3-2 shows the relationship between the input and output tables within this component.

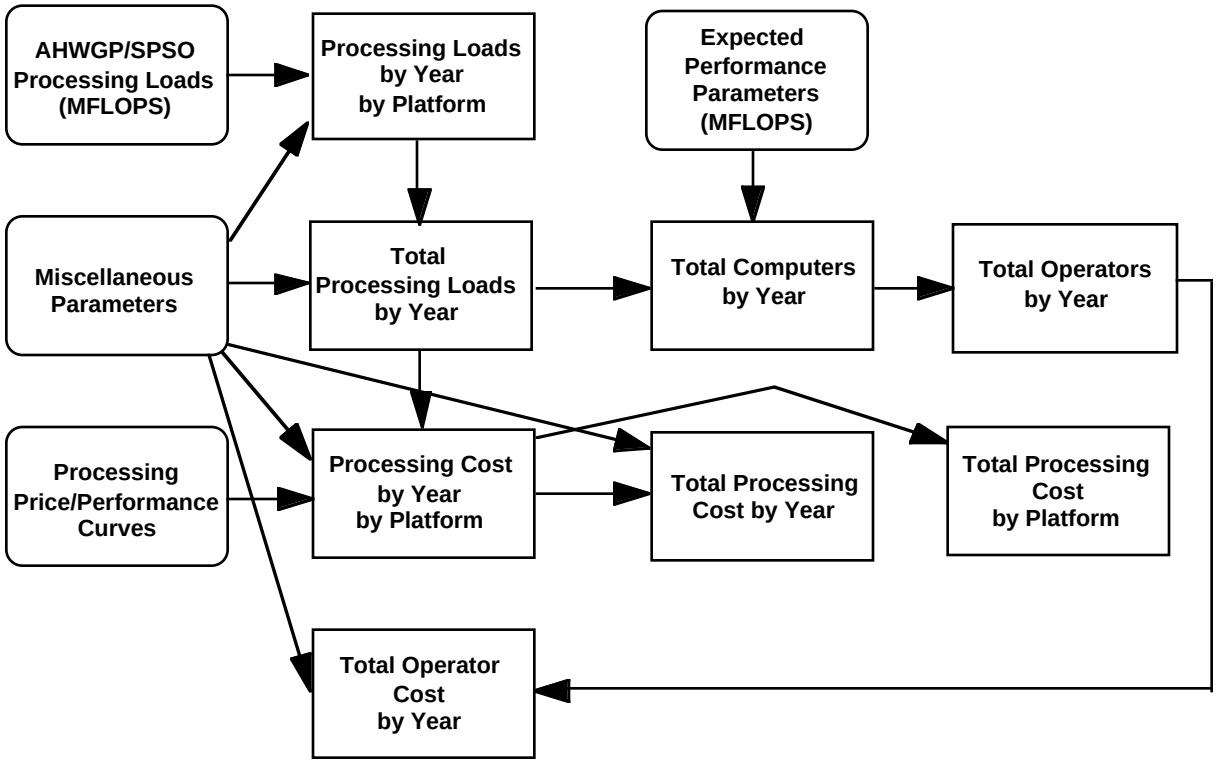

Figure 3-2. Processing Cost Component Organization

3.2.1 Inputs

3.2.1.1 Product Set Processing Loads

The primary inputs to the processing component are the At Launch and Post Launch Product Set Processing Loads by Platform and DAAC. For SDR this was a summary of the SPSO Database. For PDR it represents a summary of the integration of the SPSO and AHWGP databases. The table states the number of MFLOPS to be used by each DAAC for every platform. Table 3-5 shows the PDR Product Set processing loads for the AM-1 Platform and is representative of the content of processing loads for all platforms in the complete table.

3.2.1.2 Parameters

The miscellaneous parameters for processing include the number of days in a YEAR, the efficiency factor of 25% (EFF), GROWTH, MAINT, GAFEE, EOC, Operator Salary, Operator Shift factor, and the capacity phasing parameters (IT, RT, RP1, and RP2). See the assumptions section for further details on the capacity phasing parameters. Price/performance curves as well as expected maximum performance per year in a computer (MFLOPS) are also provided.

Table 3-5. AM-1 Processing Loads

Launch	Platform	DAACs								Total
		ASF	EDC	GSFC	JPL	LaRC	MSFC	NSIDC	ORNL	(MFLOPS)
Jun-98	AM1									
	AM1_97									
	AM1_98		147.62	3456.44		2805.48		0.97		6410.50
	AM1_99		159.43	3457.47		5350.49		0.97		8968.36
	AM1_00		159.43	3457.47		5350.49		0.97		8968.36
	AM1_01		159.43	3457.47		4457.12		0.97		8074.99
	AM1_02		159.43	3457.47		4457.12		0.97		8074.99
	AM1_PEAK		159.43	3457.47		5350.49		0.97		8968.36

3.2.2 Outputs

3.2.2.1 Processing Loads by Year

In reference to the assumptions section where capacity phasing is discussed, the appropriate multiplication factor is applied to the at launch processing load requirement for IT and RT parameters and to the appropriate post launch processing load requirement for RP1 and RP2. The result is divided by the efficiency factor (25%) to determine the additional processing capacity to be obtained in a given year. A growth factor (currently 0%) is applied to the above computations to allow for a non-compounded yearly processing load growth after launch. In the SDR time frame, the growth factor was 20%. Table 3-6 is a sample of this table based on the PDR Product Set and represents the processing capacities purchased each year at each DAAC.

Table 3-6. Total Processing Capacities by Year

		DAACs								**TOTAL**
		ASF	**EDC**	**GSFC**	**JPL**	**LaRC**	**MSFC**	**NSIDC**	**ORNL**	**MFLOPS**
Dec-94	Total_Proc_94									
Dec-95	Total_Proc_95					16.67	0.50			17.18
Dec-96	Total_Proc_96		177.14	4190.46		3416.59	1.51	1.16		7786.86
Dec-97	Total_Proc_97		531.42	12571.38	6.45	10099.73		3.48		23212.47
Dec-98	Total_Proc_98				19.36	3623.92	1.68			3644.96
Dec-99	Total_Proc_99		646.06	18454.31		28650.01	13.74	4.73		47768.86
Dec-00	Total_Proc_00		1275.46	28814.77	21.51	43585.16		7.74		73704.64
Dec-01	Total_Proc_01		27.77	17578.07	43.02	12425.58	34.61	2.95		30112.01
Dec-02	Total_Proc_02		55.54	29963.30		20163.85	69.22	5.97		50257.88
	Total_Proc		2713.40	111572.29	90.35	121981.51	121.27	26.04		236504.85

3.2.2.2 Total Computers by Year

The Total Computers by Year table uses the results of the Total Processing Load by Year table to calculate the number of computers needed at any DAAC for any year. The total processing load from the preceding table is divided by the number of MFLOPS for that year, from the Expected Performance Parameters table. That quotient is then rounded to the nearest integer. Results are summarized to show total computers needed at each DAAC, during each year, and the total needed for the project.

3.2.2.3 Total Operators by Year

The number of operators required during any year at any DAAC is estimated based on the assumption that one operator is required for every 8 computers during the day shift and for every 16 computers during the 2nd and 3rd shifts. This is calculated by taking the number of computers required at that site, dividing by 8, multiplying this by a Shift Factor of 3.13 (2/3*4.7 where 4.7 operators are required for every operator/shift to support for 24 x 7 operations) and expressing the result as the next largest integer.

3.2.2.4 Processing Cost by Year

Processing Cost by Year is a series of tables that provide processing cost by DAAC for each platform by year along with the Total Processing Cost by Year for all platforms.

The cost for each platform is calculated by multiplying a given years processing load by the appropriate price/MFLOP value. As with the Archive component discussed above, maintenance costs and total At Price costs are calculated.

The Total Processing Cost by Year for all platforms is simply a summation of the yearly costs for each platform.

3.2.2.5 Total Processing Cost by Platform

This table provides the Total Processing Cost by Platform and is simply a summation of the cost totals from the individual platforms. The resulting totals should agree with those obtained in the Total Processing Cost by Year table.

3.2.2.6 Operator Cost by Year

The last table of this component calculates the manpower cost. For each DAAC in a given year, the Operator's Salary is multiplied by the total number of computer operators that year plus all preceding years.

3.3 RAID Disk Cost Component

The RAID Disk Cost component of the model provides capacities and cost of RAID Disk. Figure 3-3 shows the relationship between the input and output tables within this component.

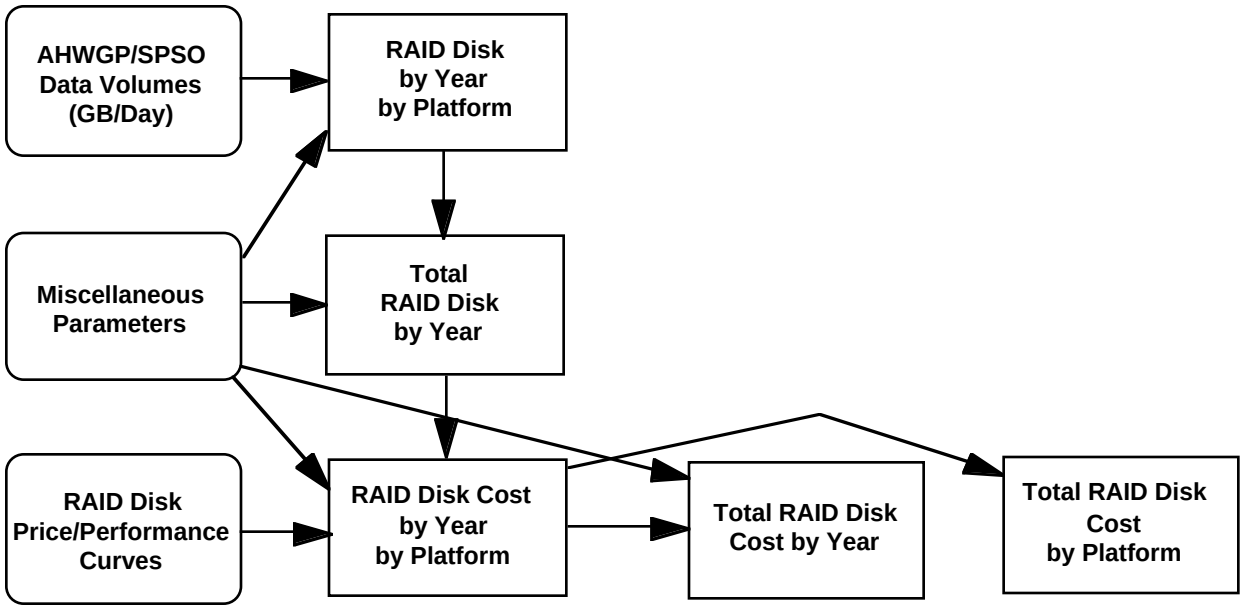

Figure 3-3. RAID Disk Cost Component Organization

3.3.1 Inputs

3.3.1.1 Product Set Data Volumes

The At Launch and Post Launch Data Volumes by Platform and DAAC represent the primary inputs for this component. For SDR this was a summary of the SPSO Database. For PDR it represents a summary of the integration of the SPSO and AHWGP databases. Table 3-1 above is representative of these inputs.

3.3.1.2 Parameters

The RAID Disk Cost component contains two tables of parameters, miscellaneous and price/performance curves. The miscellaneous parameters includes a disk factor (currently 2 specifying the number of days worth of RAID Disk needed), the threshold values for small (15 GB) and medium (50 GB) disk, GROWTH, MAINT, GAFEE, EOC, and the capacity phasing parameters (IT, RT, RP1, and RP2). See the assumptions section for further details on the capacity phasing parameters and the disk factor.

The RAID Disk Price/Performance Parameters show the price/GB by year, for the large (100 GB), medium (25 GB), and small (5 GB) disk sizes. Values can be selected from the aggressive, medium, or expected curves. See the Assumptions section for further details on how these curves are currently used.

3.3.2 Outputs

3.3.2.1 RAID Disk by Year

In reference to the assumptions section where RAID disk capacity phasing is discussed, the appropriate multiplication factor is applied to the at launch data volume requirement for IT and RT parameters and to the appropriate post launch data volume requirement for RP1 and RP2 to determine the additional RAID disk capacity to be obtained in a given year. A growth factor (currently 0%) is applied to the above computations to allow for a non-compounded yearly data volume growth after launch. In the SDR time frame, the growth factor was 20%. Table 3-7 is a sample of this table based on the PDR Product Set and represents the RAID disk capacities purchased each year at each DAAC.

Table 3-7. Total RAID Disk Capacities by Year

		DAACs								TOTAL
		ASF	EDC	GSFC	JPL	LaRC	MSFC	NSIDC	ORNL	GB
Dec-94	Total_RAID_94									
Dec-95	Total_RAID_95			0.211		0.805	2.199			3.215
Dec-96	Total_RAID_96		66.001	76.035		22.031	6.598	0.596		171.261
Dec-97	Total_RAID_97		198.003	226.204	0.109	58.857		1.788		484.962
Dec-98	Total_RAID_98			0.704	0.328	5.824	7.331			14.188
Dec-99	Total_RAID_99		228.346	393.905		106.269	15.593	2.424		746.537
Dec-00	Total_RAID_00		441.886	502.963	0.365	198.974		3.974		1148.163
Dec-01	Total_RAID_01		24.677	470.911	0.730	25.976	3.102	1.456		526.851
Dec-02	Total_RAID_02		49.354	945.477		20.345	6.204	2.925		1024.305
	Total_RAID		1008.268	2616.410	1.532	439.080	41.027	13.164		4119.481

3.3.2.2 RAID Disk Cost by Year

RAID Disk Cost by Year is a series of tables that provide RAID disk cost at each DAAC for each platform by year along with the Total Cost by Year for all platforms.

The cost for each platform is simply calculated by multiplying a given years RAID disk by the appropriate price/GB value. The appropriate price/GB is selected from the small, medium, or large price/performance curves by comparing the total RAID disk requirement for each platform with the small and medium threshold values. As with the Archive component discussed above, maintenance costs and total At Price costs are calculated.

The Total RAID Disk Cost by Year for all platforms is simply a summation of the yearly costs for each platform.

3.3.2.3 Total RAID Disk Cost by Platform

This table provides the Total RAID Disk Cost by Platform and is simply a summation of the cost totals from the individual platforms. The resulting totals should agree with those obtained in the Total RAID Disk Cost by Year table.

3.4 Distribution Cost Component

The Distribution Cost component of the model provides cost estimates for distribution. Figure 3-4 shows the relationship between the input and output tables within this component.

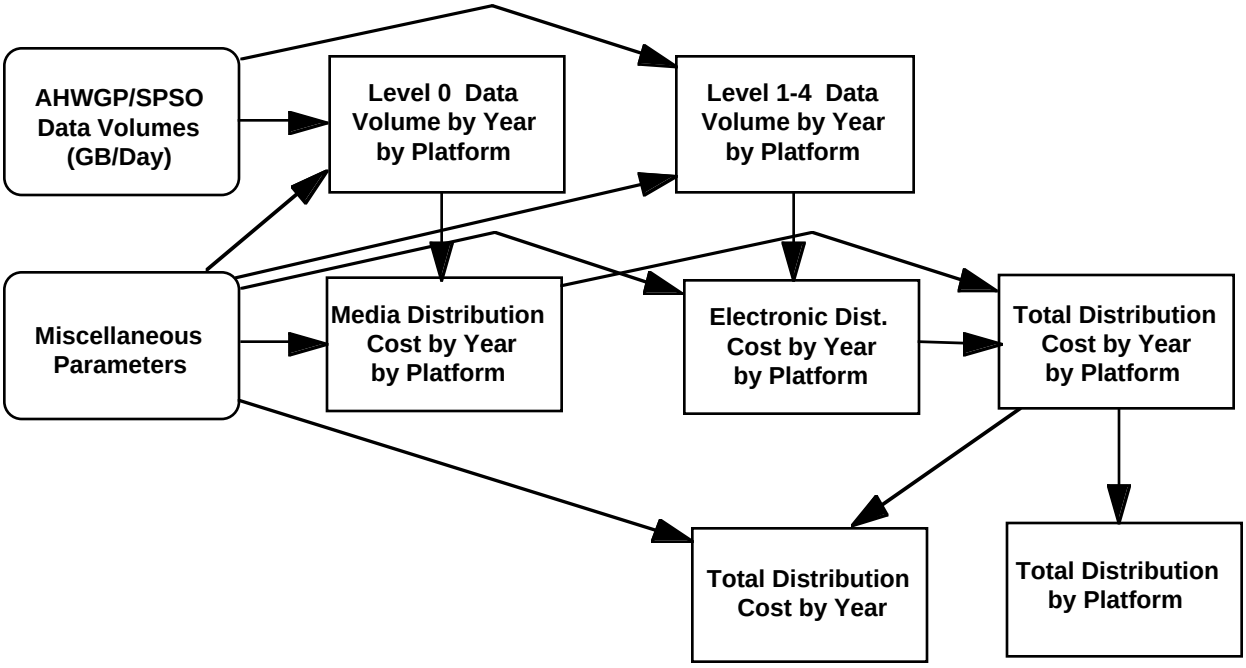

Figure 3-4. Distribution Cost Component Organization

3.4.1 Inputs

3.4.1.1 Product Set Data Volumes

The primary inputs for this component are the product set data volumes. For SDR this was a summary of the SPSO Database. For PDR it represents a summary of the integration of the SPSO and AHWGP databases. Portions of this input table are shown in Tables 2-2 and 3-1.

3.4.1.2 Parameters

The Parameters section of this component contains the contract requirements including L0 and L0-L4 Data Volume along with costs of media and electronic distribution from the contract BOM. These parameters are used to derive a price/GB for media distribution based on L0 data volume and electronic distribution based on L0-L4 data volume. These are subsequently used to estimate technical baseline cost The miscellaneous parameters for this component include the number of days in a YEAR, MAINT, GAFEE, EOC, and RT. The RT parameter establishes when the cost of these entities should be allocated relative to the platform launch date. Currently, RT is set to -17 months.

3.4.2 Outputs

3.4.2.1 L0 Data Volume by Year

This series of tables, one for each platform plus the summary table, posts the L0 Data volume for each DAAC for each calendar year. The data volume is allocated to the appropriate calendar year based on the RT parameter discussed above. If the RT parameter relative to the appropriate launch date falls within the current year, the appropriate L0-L4 Data Volume is assigned. Otherwise, the value of zero is assigned.

3.4.2.2 L1-L4 Data Volume by Year

This series of tables, similar to the previous set of tables, posts the L1-L4 Data volume for each DAAC for each calendar year. The data volume is allocated to the appropriate calendar year based on the RT parameter discussed above. If the RT parameter relative to the appropriate launch date falls within the current year, the appropriate L1-L4 Data Volume is assigned. Otherwise, the value of zero is assigned.

3.4.2.3 Media Distribution Cost by Year

Media Distribution Cost by Year is a series of tables that provide media distribution cost at each DAAC for each platform by year along with the Total Cost by Year for all platforms.

The cost for each platform is simply calculated by multiplying a given years data volume by the Media Distribution price/GB value which was derived from the media distribution costs in the contract BOM and the contract data volume requirements. As with the Archive component discussed above, maintenance costs and total At Price costs are calculated.

The Total Media Distribution Cost by Year for all platforms is simply a summation of the yearly costs for each platform.

3.4.2.4 Electronic Distribution Cost by Year

Electronic Distribution Cost by Year is a series of tables that provide electronic distribution cost at each DAAC for each platform by year along with the Total Cost by Year for all platforms.

The cost for each platform is simply calculated by multiplying a given years data volume by the Electronic Distribution price/GB value which was derived from the media distribution costs in the contract BOM and the contract data volume requirements. As with the Archive component discussed above, maintenance costs and total At Price costs are calculated.

The Total Electronic Distribution Cost by Year for all platforms is simply a summation of the yearly costs for each platform.

3.4.2.5 Distribution Cost by Year

The Distribution Cost by Year is a series of tables combining the data of the Media Distribution Cost and Electronic Distribution Cost tables. The two elements are added together for each

platform to get the combined distribution cost. These are then summarized in the Total Distribution Cost by Year table.

3.4.2.6 Total Distribution Cost by Platform

This table provides the Total Distribution Cost by Platform and is simply a summation of the cost totals from the individual platforms. The resulting totals should agree with those obtained in the Total Distribution Cost by Year table.

3.5 ESN, IMS, SMC Cost Component

This component of the model provides cost estimates for the SDPS LANs (ESN), Information Search/Access (IMS), and the SMC. Figure 3-5 shows the relationship between the input and output tables within this component. All cost values in this component are expressed in thousands of dollars ($K).

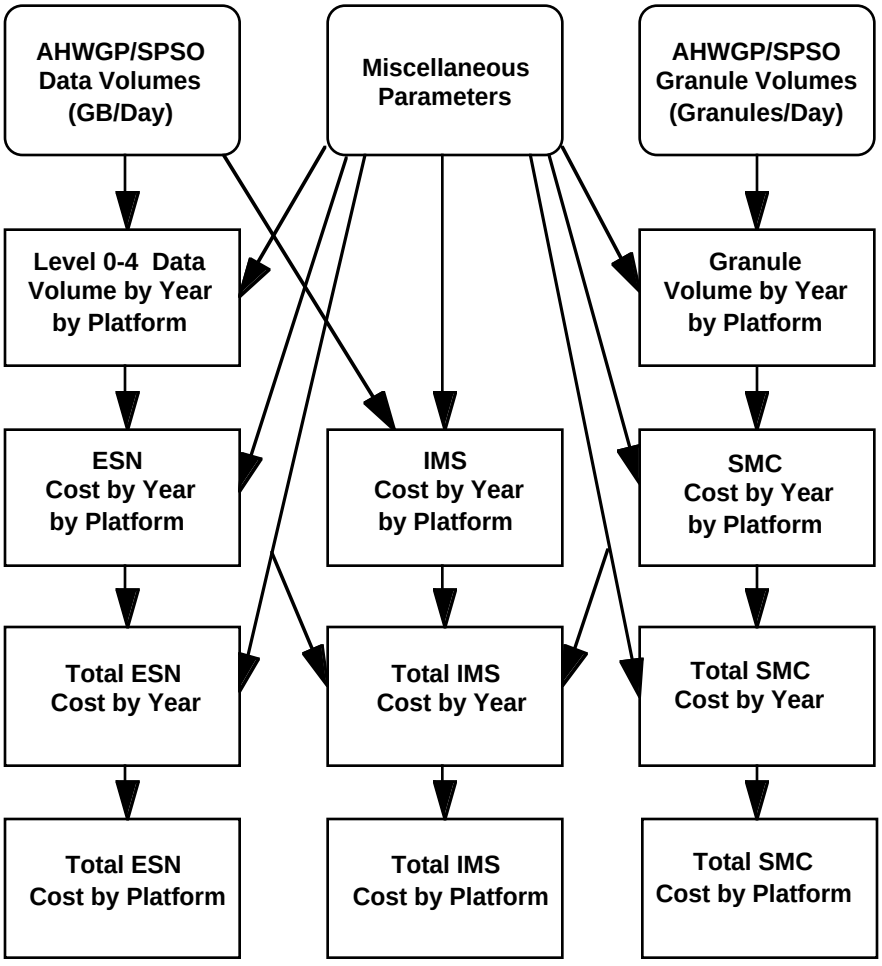

Figure 3-5. ESN, SMC, & IMS Cost Component Organization

3.5.1 Inputs

3.5.1.1 Product Set Data Volumes

The primary inputs for the ESN and IMS entities are the product set data volumes. For SDR this was a summary of the SPSO Database. For PDR it represents a summary of the integration of the SPSO and AHWGP databases. Portions of this input table are shown in Tables 2-2 and 3-1.

3.5.1.2 Product Set Granules Volumes

The primary inputs for the SMC entity are the product set granule volumes. For SDR this was a summary of the SPSO Database. For PDR it represents a summary of the integration of the SPSO and AHWGP databases. Table 2-3 shows the PDR version of these inputs.

3.5.1.3 Parameters

The Level 0-4 Data Volumes and Granule Volumes from the contract requirements are used in conjunction with the element costs for ESN, IMS, and SMC from our contract BOM to derive a price/GB and price/Granule that are subsequently used to estimate technical baseline cost The miscellaneous parameters for this component include the number of days in a YEAR, MAINT, GAFEE, EOC, and RT. As with the Distribution component, the RT parameter establishes when the cost of these entities should be allocated relative to the platform launch date. Currently, RT is set to -17 months. There are also site activation dates for each DAAC. These dates are derived from the ECS Master Schedule.

3.5.2 Outputs

3.5.2.1 L0-L4 Data Volumes by Year

This series of tables, one for each platform plus the summary table, posts the L0-L4 Data volume for each DAAC for each calendar year. The data volume is allocated to the appropriate calendar year based on the RT parameter discussed above. If the RT parameter relative to the appropriate launch date falls within the current year, the appropriate L0-L4 Data Volume is assigned. Otherwise, the value of zero is assigned.

3.5.2.2 Granules by Year

The tables for Granules by Year are similar to those for Data Volume per Year except the appropriate granule volumes are assigned to the appropriate DAACs by year.

3.5.2.3 ESN Outputs

3.5.2.3.1 ESN Site Activation Cost by Year

ESN Site Activation Cost is allocated to the AM1 platform. These costs are based on the non-SDPS LAN costs (such as FOS and SMC LANs) from the contract BOM and are simply carried forward as fixed costs. They are allocated to the DAACs in the appropriate years based on the site activation dates.

3.5.2.3.2 ESN Cost by Year

ESN Cost by Year is a series of tables that provide ESN cost at each DAAC for each platform by year along with the Total Cost by Year for all platforms.

The cost for each platform is simply calculated by multiplying a given years data volume by the ESN price/GB value which was derived from the ESN (SDPS LAN specific) costs in the contract BOM and the contract data volume requirements. As with the Archive component discussed above, maintenance costs and total At Price costs are calculated.

The Total ESN Cost by Year for all platforms is simply a summation of the yearly costs for each platform.

3.5.2.3.3 ESN Cost by Platform

This table provides the Total ESN Cost by Platform and is simply a summation of the cost totals from the individual platforms. The resulting totals should agree with those obtained in the Total ESN Cost by Year table.

3.5.2.4 SMC Outputs

3.5.2.4.1 SMC Site Activation Cost by Year

As in the ESN entity, SMC Site Activation Costs are allocated to the AM1 platform . These costs are based on the SMC workstations and peripheral costs from the contract BOM and are simply carried forward as fixed costs. They are allocated to the DAACs in the appropriate years based on the site activation dates.

3.5.2.4.2 SMC Cost by Year

SMC Cost by Year is a series of tables that provide SMC cost at each DAAC for each platform by year along with the Total Cost by Year for all platforms.

The cost for each platform is simply calculated by multiplying a given years granule volume by the SMC price/granule value which was derived from the SMC File Server and Disk costs in the contract BOM and the contract granule volume requirements. As with the Archive component discussed above, maintenance costs and total At Price costs are calculated.

The Total SMC Cost by Year for all platforms is simply a summation of the yearly costs for each platform.

3.5.2.4.3 Total SMC Cost by Platform

This table provides the Total SMC Cost by Platform and is simply a summation of the cost totals from the individual platforms. The resulting totals should agree with those obtained in the Total SMC Cost by Year table.

3.5.2.5 IMS Outputs

3.5.2.5.1 IMS Cost by Year

IMS Cost by Year is a series of tables that provide IMS cost at each DAAC for each platform by year along with the Total Cost by Year for all platforms.

The cost for each platform is simply calculated by multiplying a given years data volume by the IMS price/GB value which was derived from the IMS costs in the contract BOM and the contract data volume requirements. As with the Archive component discussed above, maintenance costs and total At Price costs are calculated.

The Total IMS Cost by Year for all platforms is simply a summation of the yearly costs for each platform.

3.5.2.5.2 Total IMS Cost by Platform

This table provides the Total IMS Cost by Platform and is simply a summation of the cost totals from the individual platforms. The resulting totals should agree with those obtained in the Total IMS Cost by Year table.

3.6 Cost Summary Component

The Cost Summary Component is a series of tables which draws together the data from the other components and summarizes the information. The format of the tables in this summary is distinct from that in the other components in that the cost breakout by DAAC is not carried forward to this component. Three output formats are shown below. Figure 3-6 shows the relationship between the inputs and outputs of this component. All cost values in this component are expressed in thousands of dollars ($K).

3.6.1 Inputs

As shown in Figure 3-6 above, the primary inputs to this component are the outputs from the Archive, Processing, RAID Disk, Distribution, and ESN, IMS, and SMC components. Fixed elements of cost derived from the contract BOM that are input directly to this spreadsheet include all of FOS, Sustaining Engineering, and ROOD COTS costs. Additional inputs derived from the contract BOM include the Processing COTS software percentage and the percentage allocations of the fixed element costs to fiscal year and platforms.

3.6.2 Outputs

3.6.2.1 Breakout by Function

This table is a general summary of the cost breakout by function, of the various elements of the model. Table 3-8 shows the format of this output. The cost for FOS, Sustaining Engineering, and ROOD (which is included in the Processing function) are derived from the contract BOM. Processing COTS SW is estimated at 22% of processing hardware (not including ROOD). The percentage is derived from the contract BOM. The costs of all other functions are outputs from

the other components of the model. The function costs are totaled and compared to the Current COTS Budget. Shortfalls or reserves relative to the budget are noted. See the Assumptions description in Section 2 for the difference between the expected and hybrid cases.

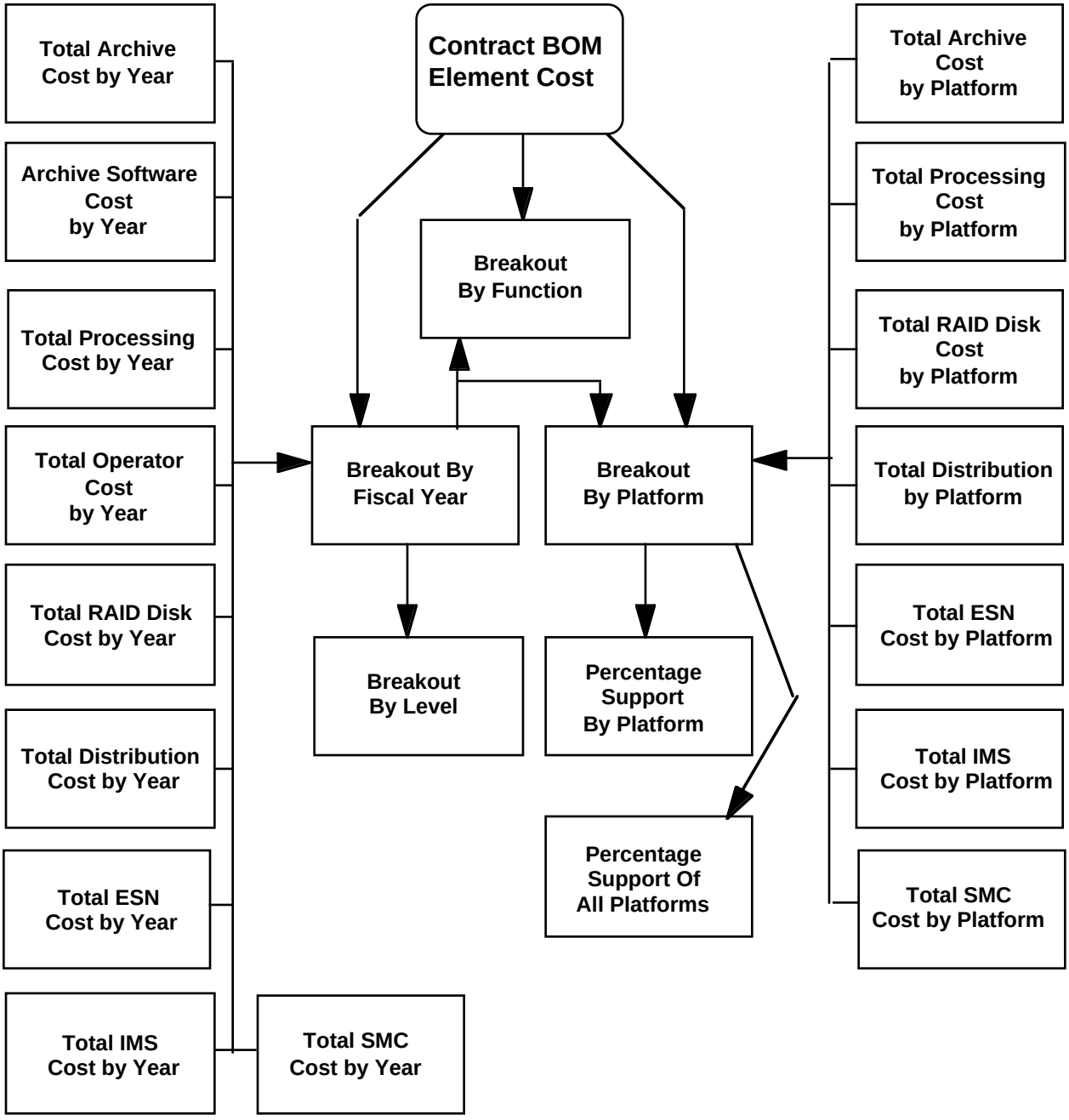

Figure 3-6. Cost Summary Component Organization

Table 3-8. Cost Breakout by Function

Function	Expected Case ($ in Thousands)	Hybrid Case ($ in Thousands)
FOS	$	$
SMC and LSMs	$	$
SDPS LANs	$	$
Distribution/Ingest	$	$
Info. Search/Access	$	$
RAID Disk	$	$
Archive	$	$
Archive COTS SW	$	$
Processing	$	$
Processing COTS SW	$	$
Operations	$	$
Sustaining Eng. COTS	$	$
Totals	$	$
Current COTS Budget	$	$
Shortfall/(Reserve)	$	$

3.6.2.2 Breakout by Platform

The platform cost results, as well as ROOD and V0, are summarized by the Expected and Hybrid Cases. Table 3-9 shows the format of this output.

Table 3-9. Cost Breakout by Platform

Platform	Expected Case ($ in Thousands)	Hybrid Case ($ in Thousands)
ROOD	$	$
V0	$	$
TRMM	$	$
AM-1	$	$
LANDSAT7	$	$
COLOR	$	$
ADEOSII	$	$
ALT RADAR	$	$
ACRIMSAT	$	$
RSA/CNES	$	$
SPACE STATION	$	$
PM-1	$	$
CHEM	$	$
ALT LASER	$	$
Totals	$	$

3.6.2.3 Breakout by Level

Costs at product levels 1, 2, 3/4, and total cost are estimated for Expected and Hybrid cases. The estimates are generated based on the percentage of data volumes and processing loads for each product level from the SPSO summary tables. ROOD costs are allocated to level 3/4. These estimates are currently based on the SDR Product Set because the AHWGP data is not overtly broken out by product level.

3.6.2.4 Breakout by Fiscal Year

Table 3-10 shows the format of this table which provides the cost summary breakout by fiscal year.

Table 3-10. Cost Breakout by Fiscal Year

Fiscal Year	Expected Case ($ in Thousands)	Hybrid Case ($ in Thousands)
1994	$	$
1995	$	$
1996	$	$
1997	$	$
1998	$	$
1999	$	$
2000	$	$
2001	$	$
2002	$	$
Totals	$	$

3.6.2.5 Percentage Platform Support

This table determines the percentage of platform support that can be provided over time within the existing budget. It processes the platforms in order of launch date with ROOD and V0 being first. Once the budget has been exhausted, subsequent platforms show a percentage support of 0%.

3.6.2.6 Percentage Support of all Platforms

The last table of the Cost Summary Component calculates the percentage of the totaled costs being supported by the COTS Budget. The COTS Budget is divided by both the Expected case total and the Hybrid case total to generate the percentage supported across all platforms.

Abbreviations and Acronyms

ACRIMSAT	One of the new platforms
ADEOS II	Advanced Earth Observing Satellite (Japan)
AERO	(EOS AERO) EOS Aerosol Project
AHWGP	Ad Hoc Working Group on Production
ALT LASER	One of the new platforms
ALT RADAR	One of the new platforms
AM1	EOS AM Project spacecraft 1, morning spacecraft series -- ASTER, CERES, MISR, MODIS and MOPITT instruments
ASF	Alaska SAR Facility
BOM	Bill of Materials
CHEM	EOS Chemistry Mission (HIRDLS, MLS, and TES instruments)
CSMS	Communications and Systems Management Segment
COLOR	EOS Ocean Color Project
COTS	commercial off-the-shelf (hardware or software)
DAAC	Distributed Active Archive Center
DAO	Data Assimilation Organization at GSFC
ECS	EOSDIS Core System
EDC	EROS Data Center
EOC	End of Contract
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
EROS	Earth Resources Observation System
ESN	EOSDIS Science Network (ECS)
FOS	Flight Operations Segment (ECS)
GAFEE	General and Administration (Overhead) and Fee
Granule	The smallest aggregation of data that is independently managed (i.e., described, inventoried, retrievable).
GSFC	Goddard Space Flight Center
IMS	Information Management System (ECS)

JPL	Jet Propulsion Laboratory
LAN	Local Area Network
Landsat 7	Land Remote-Sensing Satellite
LaRC	Langley Research Center
LSM	Local System Management (ECS)
M&O	Maintenance and Operations
MFLOPS	mega (millions of) floating-point operations (10^6) per second
MSFC	Marshall Space Flight Center
NSIDC	National Snow and Ice Data Center
ORNL	Oak Ridge National Laboratory
PDR	Preliminary Design Review
PM1	EOS Afternoon Crossing (Ascending) Mission (afternoon spacecraft series)
RAID	redundant array of inexpensive disks
ROOD	Predetermined COTS cost for the DAO from the Contract (ECS) BOM
RSA/CNES	One of the new platforms/Centre National d'Etudes Spatiales (France)
SDPS	Science Data Processing Segment
SDR	System Design Review
SMC	System Monitoring and Coordination (ECS)
SS	Space Station (one of the new platforms)
SPSO	Science Processing Support Office
TRMM	Tropical Rainfall Measuring Mission (joint US-Japan)
V0	Version 0